Study of Augmented Reality Applications
Use in Education and Its Effect on
the Academic Performance

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ABSTRACT

Augmented reality (AR) applications can be used in almost all education and training environments. In this study, it reveals the relationship between perceived usefulness, utility and attitudes regarding the use of AR applications in educational environments as well as the relationship between attitude levels and academic achievements. It also reveals the effect of AR application use on academic achievement in education. According to the findings obtained in the study, the followings have been found: the perceived ease of use of students regarding AR applications in educational environments has a strong positive effect on perceived benefit; the perceived benefit and ease of use influence the attitude levels strongly in the positive direction; there is no semantic relation between attitude levels and academic achievement; and the use of AR applications in educational processes increases the academic achievement of students.

KEYWORDS

Academic Performance, Attitude, Augmented Reality, Ease of Use, TAM, Utility

1. INTRODUCTION

Augmented reality (AR) combines real-life objects, places, and people around us with simulated experiences produced by a variety of information and computer technologies (Ivanova & Ivanov, 2011). Augmented reality was first introduced in the 1990s for use in training air force and airline pilots. (Caudell & Mizell, 1992). The developments in the augmented reality technology in recent years affected the educational environment as well as all other developments in information and communication technologies. The interest in AR applications has increased considerably in order to create unique educational environments. Nevertheless, research on the effectiveness, usefulness, availability and challenges of AR is still in its infancy and needs to be further examined.

The fact that AR technologies can be used without the need for expensive equipment strengthens its applicability in educational environments. With AR applications, training materials can give different dimensions and interaction between individuals and materials can be enhanced. When used effectively, AR increases students’ will and concentration in learning (Zhang, Sung, Hou, & Chang, 2014). At the same time, AR applications enable students to carry out the learning process on their own allowing the teacher to save the time that he or she would use to repeatedly explain the subject. Students welcome AR technology, so well-organized AR applications ensure that learning processes are carried out successfully (Martín-Gutiérrez et al., 2015).

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In the study by Akçayır and Akçayır (2017), they systematically deconstructed the AR literature of social science citation index (SSCI) journals and reviewed 68 research articles. Therein, they analyze factors such as student level, AR technology type, publication year, advantages and difficulties of using AR in educational settings. According to findings obtained in their study, the biggest advantage of using AR applications in education is to support learning success. In addition, common technical problems and usability problems have emerged as difficulties in using AR in education (Akçayır & Akçayır, 2017). Wojciechowski & Cellary’s (2013) study examined students’ attitudes towards Augmented Reality Interactive Environment System (ARIES). According to the results, perceived usefulness and perceived pleasure have a similar effect on attitudes towards the use of image-based AR environments but the perceived pleasure is a much more important factor than the perceived usefulness. For this reason, the use of AR environments in teaching processes may provide additional motivation for young students (Wojciechowski & Cellary, 2013).

Akçayır, Akçayır, Pektaş, and Ocak (2016), conducted an empirical study on 76 first-year university students of science laboratories, and examined the effects of AR technologies on laboratory skills and attitudes of university students towards laboratories. They found that AR technology significantly increases the development of laboratory skills of university students. Their study also found that AR technology helps students both develop laboratory skills and develop positive attitudes towards physics laboratories (Akçayır et al., 2016). Quick response (QR) code as one of the original AR technologies let people access the digital information, graphics and 3D animations through their mobile scanner applications. In educational context, QR codes can be applied in a number of ways such as subscribing students to RSS news feed and inserting QR codes within lecture presentations and printed course materials (Ramsden, 2008). The current study utilizes in class presentations and Facebook as a media platform to share QR codes with the experimental group of students. The reason to use social media platform as context in this study lies in the fact that the numbers of Internet users, the rate of Internet usage, the number of social media users are constantly increasing in the world. Facebook is the most popular social media platform in the world and it has been grown rapidly since its establishment in 2004 (Duggan, Ellison, Lampe, Lenhart, & Madden, 2015). While social media tools like Facebook and Twitter are the communication technologies that have been widely adopted by students in recent years (Roblyer, McDaniel, Webb, Herman, & Witty, 2010), educators have also adopted social networking tools as online learning communities to present their lessons and reach their students. Moreover, Mazer, Murphy and Simonds (2009) defined Facebook as a potential platform that can contribute to student-teacher relationships and increase student-teacher cooperation.

Akcaoglu and Bowman’s (2016) found that based on sample of 112 respondents; there is a difference that favors Facebook users between the students who actively use Facebook and those who are not personally interested. In a study that was conducted with teachers regarding awareness of pedagogical achievements, Ajjan and Hartshorne (2008) noted that a majority of teachers showed a positive attitude towards integrating social media into teaching.

Recent developments in AR technologies have also affected the educational environment. The cost effectiveness of AR applications is one of the factors that make its use in education attractive. In addition, AR applications are important for educational environments because they enable learners to interact with course content and to examine objects in many dimensions. For this reason, research on the use of augmented reality technologies has gained importance in education-training processes.

1.1. Theoretical Background

Davis, Bagozzi, and Warshaw (1989) created Technology Acceptance Model (TAM) which is used to explain the individual acceptance of information systems, from the Theory of Reasoned Action (TRA) that recognizes intentional human behavior. According to TAM, the intention to use a particular technology is guided by the individual attitudes. The two main factors that lead to positive attitudes when using new technology are the perceived ease of use and usefulness. However, the perceived ease of use affects the perceived usefulness positively (Davis et al., 1989).
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